IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Michael S. Beck Kevin L. Conrad	Group Art Unit:	3661
		Examiner:	Chong H. Nguyen
Serial No.:	10/784,341	Atty. Docket:	2063.007400
Filed:	February 23, 2004		
For:	System And Method For Dynamically Controlling An Attitude Of An Articulated Vehicle	Client Docket:	VS-00647
		Confirmation:	2359

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby submit this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated December 2, 2008. The Notice of Appeal was filed on March 2, 2009 with a request for a pre-Appeal Brief panel review. The decision of the panel review was mailed April 6, 2009. Therefore, the appeal brief was due on May 6, 2009. Therefore, Applicants respectfully request a one-month extension of time under 37 CFR § 1.136(a) to allow the paper to be timely filed. June 6, 2009 fell on a Saturday therefore this paper is being electronically filed on Monday, June 8, 2009. The fee for requesting a one-month extension of time is $130.00.

The Commissioner is authorized to deduct the fee for the requested one-month extension of time, and any additional extension of time required to enable this paper to be timely filed from Williams, Morgan & Amerson's Deposit Account No. 50-0786/2063.007400/TDM.

The fee for filing this Appeal Brief is $540 and the Commissioner is authorized to deduct said fee from Williams, Morgan & Amerson's Deposit Account No. 50-0786/2063.007400/TDM.

It is believed that no additional fee is due, however, should any fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason, consider this paragraph as authorization to withdraw the said fees from Williams, Morgan & Amerson, P.C. Deposit Account No. 50-0786/2063.007400/TDM.

I. REAL PARTY IN INTEREST

Lockheed Martin Corporation, the assignee hereof, is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences of which Applicants, Applicants' legal representative, or the Assignee are aware that will directly affect or be directly affected by or have a bearing on the decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 1-53 are pending in the case.

The Office rejected claims 1-19. Claims 1-4, 9-10, 14-15, and 17-18 were rejected as being anticipated under 35 U.S.C. §102(e) by U.S. Letters Patent 6,010,139 ("Heyring"). Claim 5 was rejected as being obvious under 35 U.S.C. §103(a) over Heyring in combination with U.S. Publication No. 2003/0001734 ("Schofield").[1] Claims 6 and 15 were rejected as being obvious under 35 U.S.C. §103(a) over Heyring in combination with U.S. Patent No. 6,267,196 ("Wilcox"). Claims 7-9, 13, 16 and 19 were rejected as being obvious under 35 U.S.C. §103(a) over Heyring in combination with U.S. Patent No. 4,313,511 ("Soo Hoo"). Claims 11-12 were rejected as being obvious under 35 U.S.C. §103(a) over Heyring in combination with U.S. Patent No. 4,243,278 ("Horan"). Each of the rejections is currently on appeal.

Claims 20-53 were indicated as being withdrawn from consideration in the "Panel Decision from Pre-Appeal Brief Review" dated April 6, 2009.[2]

Applicants identify the claims in this appeal as claims 1-19.

IV. STATUS OF AMENDMENTS

There were no amendments submitted after the "final" Office Action.

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[1] Applicants do not concede the status of Schofield as "prior art". Schofield does not actually qualify as prior art under any provision of 35 U.S.C. §102. The Office may nevertheless cite Schofield under the legal fiction that it evidences what was "known by others" under 35 U.S.C. §102(a) on the assumption that Applicants' data of invention is their date of filing. Applicants reserve the right to "swear behind" Schofield at a future date should they choose to do so. *See* M.P.E.P. §2132.91.

[2] Applicants have filed a "Petition to Invoke the Supervisory Authority of the Commissioner" regarding the impropriety of the restriction requirement that resulted in claims 20-53 being withdrawn. Applicants have not yet received a response to the petition.

V. SUMMARY OF CLAIMED SUBJECT MATTER

FIG. 1A-FIG. 1C are a side elevational, an end elevational view, and a top plan view, respectively, of an illustrative embodiment of the vehicle 100 according to the present invention. ¶[0039] The vehicle 100 comprises a plurality of wheel assemblies 102 articulated with a chassis 104. ¶[0039] In the illustrated embodiment, each of the plurality of wheel assemblies 102 is rotationally articulated with the chassis 104, as indicated by arrows 103. ¶[0039] Other articulations, however, are possible, such as linear articulations. ¶[0039] The scope of the present invention relates to a vehicle utilizing any type of articulation, not just the rotational articulation of **FIG. 1A-FIG. 1C**. ¶[0039]

In the embodiment illustrated in **FIGS. 1A-1C**, the wheel assemblies 102, when attached to the chassis 104, implement an articulated suspension system for the vehicle 100. ¶[0040] Thus, by way of example and illustration, the articulated suspension system is but one articulable means for rolling the chassis 104 along a path in accordance with the present invention. ¶[0040] Each of the wheel assemblies 102 comprises a link structure or suspension arm, 112, a wheel 116 articulable with respect to the link structure 112, and a hub drive 114 for rotating the wheel 116. ¶[0041] The vehicle 100, as illustrated in **FIG. 1A-FIG. 1C**, includes six wheel assemblies 102. ¶[0041]

The vehicle 100, for example, may comprise the same number of wheel assemblies 102 articulated with a first side 106 and articulated with a second side 108 of the chassis 104, as shown in **FIG. 1A-FIG. 1C**. ¶[0042] However, the vehicle 100 may alternatively include a different number of wheel assemblies 102 articulated with the first side 106 than are articulated with the second side 108. ¶[0042] Thus, for example, the scope of the present invention encompasses a vehicle (*e.g.*, the vehicle 100) having three wheel assemblies 102 articulated with the first side 106 and four wheel assemblies 102 articulated with the second side 108. ¶[0042] Generally, a vehicle 100, such as the one shown in **FIG. 1A-FIG. 1C**, comprises ¶[¶[0043]: the chassis 104 ¶[0044]; a plurality of suspension arms 112 ¶[0045]; a shoulder joint for articulating each of the suspension arms 112 with the chassis 104 ¶[0046]; an active damper (*e.g.*, a magnetorheological ("MR") rotary damper) connecting each of the suspension arms 112 to the chassis 104; ¶[0048] a drive train for propelling the vehicle 100 ¶[0047]; and a power system for powering the drive train, control system, and other elements of the vehicle 100 ¶[0049].

FIG. 14 is a stylized block diagram of an illustrative embodiment of a system for controlling an attitude of an articulated vehicle according to the present invention. ¶[0029] As

can be seen therein, the vehicle 100 includes a controller 1402 and a variety of sensors acquiring data from which the state of the vehicle can be ascertained. (*see* **FIG. 13**; ¶[0110]-¶[0118]) For example, the wheel assemblies 102 include a load sensor 1404, the shoulder joints 110 each have an encoder 1418, the tires 410 have pressure sensors 1405, *etc*.

The illustrated embodiment executes various control methodologies in a predictive manner, taking into account the dynamic properties of the vehicle 100. ¶[0111] **FIG. 13** illustrates one particular embodiment of the predictive control model according to the present invention. ¶[0111] The predictive control model (represented by block 1302) comprises a real-time physics model of the vehicle 100 adapted to predict the motion of the vehicle 100 before the motion takes place. ¶[0111] The model 1302 uses as inputs at least one of many current vehicle properties (represented by block 1304), such as the vehicle's sprung and unsprung mass of the vehicle 100, other articulable mass of the vehicle 100 (*e.g.*, ¶[0111] the turret 1602, the sensor mast 1702, and the like), and the mission configuration of the vehicle 100, as well as the inertia, velocity, acceleration, and momentum of the vehicle 100. ¶[0111] The current vehicle attitude and location (represented by block 1306) and the desired vehicle attitude and location (represented by block 1308) are also inputs to the predictive control model 1302. ¶[0111]

In real time, the predictive control model 1302 calculates the control commands (represented by block 1310) required to move the vehicle 100 to the desired attitude and location. ¶[0112] The model calculates the CG and stability limits of the vehicle 100 in its current state and manipulates the wheel assemblies 102, active dampers (*e.g.*, the rotary MR dampers 402), and any other articulable mass associated with the vehicle 100 to affect the CG and stability limits of the vehicle 100 to reach the desired location and attitude without unfavorable impacts such as a roll-over. ¶[0112] In the same way a skier shifts weight to his downhill ski to improve stability, the predictive control model 1302 dynamically articulates the wheel assemblies 102 (and/or other articulable masses of the vehicle 100) to place the vehicle in a more stable configuration, taking into account the vehicle's dynamic properties, CG, and stability limits, to achieve the desired vehicle state. ¶[0113]

The vehicle 100, through the implementation of the predictive control model 1302 by the controller 1402, assess the state of the vehicle 100 and articulates the suspension system by rotating the wheel assemblies 102. In general, the vehicle's stability may be controlled by determining at least one dynamic property of the vehicle (*e.g.*, the inertia, acceleration, velocity, momentum, and the like) and manipulating the articulated suspension based on the at least one

dynamic property to affect the stability of the vehicle. ¶[0097] As the vehicle 100, 1500 travels, it will likely encounter various types of terrain. If the terrain is relatively smooth and flat, little stability control may be required. ¶[0098] If the terrain is rough and/or hilly, however, more complex control of the vehicle 100, 1500 may be required. ¶[0098]

Thus, two exemplary scenarios are presented in the application in **FIG. 11** and **FIG. 12**. **FIG. 11** is a flow chart of a first illustrative embodiment of a method of controlling stability of an articulated vehicle. ¶[0026] **FIG. 12** is a flow chart of a second illustrative embodiment of a method of controlling stability of an articulated vehicle. ¶[0027]

Turning now to **FIG. 11**, in this scenario, control is exercised based on the vehicle 100 traversing across a generally smooth terrain, such that the positions of the wheel assemblies 102 are not actively controlled with respect to the chassis 104. ¶[0102] The damping scenario is determined (block 1102) based upon one or more characteristics of the vehicle (*e.g.* ¶[0102], the mass of the sprung and unsprung components and inertia, momentum, velocity, acceleration, attitude, location, and the like) and/or the mission configuration of the vehicle. ¶[0102] The damping levels of the active dampers are adjusted based upon the damping scenario (block 1104). ¶[0103] The dynamic response of the vehicle 100 is sensed (block 1106) based upon at least one of various properties of the vehicle 100, such as mass, inertia, velocity, acceleration, attitude, and location. ¶[0103] The dynamic response data (of block 1106) is analyzed (block 1108) to determine if the control should be biased depending upon the relationship between the actual dynamic response and the desired dynamic response. ¶[0103]

In this scenario of **FIG. 12**, the wheel assemblies 102 are actively controlled to maintain a desired stability of the vehicle 100. ¶[0106] the loads on each of the wheel assemblies 102 are determined (block 1202). ¶[0106] A determination is made as to whether the forces are level, *i.e.*, whether the forces on each of the wheel assemblies 102 are substantially level, *i.e.*, substantially equal (block 1204). ¶[0107] If the forces are not level, one or more of the vehicle components (*e.g.*, the wheel assemblies 102, the turret 1602 of **FIG. 16**, the mast 1702 of **FIG. 17**, or the like) is articulated with respect to the chassis 104 to level the forces (block 1206). ¶[0107]

Once the forces are leveled, the damping scenario is determined (block 1208) based upon one or more characteristics of the vehicle (*e.g.*, the mass of the sprung and unsprung components, the inertia, the momentum, the velocity, the acceleration, the attitude, the location, and the like) and/or the mission configuration of the vehicle. ¶[0108] The damping levels of the

active dampers are adjusted based upon the damping scenario (block 1210). ¶[0108] The dynamic response of the vehicle 100 is sensed (block 1212) based upon at least one of various properties of the vehicle 100, such as mass, inertia, velocity, acceleration, attitude, and location. ¶[0108] The dynamic response data (of block 1212) is analyzed (block 1214) to determine if the control should be biased depending upon the relationship between the actual dynamic response and the desired dynamic response. ¶[0108]

Now, turning to the language of the claims themselves, **claims 1 and 14** are independent claims. With respect to **claim 1**, a method of controlling stability of a vehicle (*e.g.*, 100, **FIG. 1**; ¶[0049]-¶[0043]; **FIG. 14**) having an articulated suspension (*e.g.*, 100, 102, 110, 112, **FIG. 1**; ¶[0039]-¶[0096]; **FIG. 14**), the invention comprises:

- determining (*e.g.*, 1202, **FIG. 12**; ¶[0102]) at least one dynamic property of the vehicle; and
- manipulating (*e.g.*, 1208-1210, **FIG. 12**; ¶[0106]-¶[0108]) the articulated suspension based on the at least one dynamic property to affect the stability of the vehicle.

With respect to **claim 14**, a method of controlling stability of a vehicle (*e.g.*, 100, **FIG. 1**; ¶[0049]-¶[0043]; **FIG. 14**) having an articulated suspension (*e.g.*, 100, 102, 110, 112, **FIG. 1**; ¶[0039]-¶[0096]; **FIG. 14**), the invention comprises:

- determining (*e.g.*, 1102, **FIG. 11**; ¶[0102]) a damping scenario; and
- adjusting damping levels (*e.g.*, ¶[0099]-¶[0103]) of a plurality of active dampers of the articulated suspension.

Note that the references in parentheses are not limitations in the claims but relate the claim language to Applicant's disclosure in compliance with the Rules of Practice.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant respectfully requests that the Board review and overturn the rejections present in this case. The following issues are presented on appeal in this case:

A. Whether claims 1-4, 9-10, 14-15, and 17-18 are anticipated under 35 U.S.C. §102(e) by Heyring;

B. Whether claim 5 would have been obvious under 35 U.S.C. §103(a) over Heyring in combination Schofield;

C. Whether claims 6 and 15 would have been obvious under 35 U.S.C. §103(a) over Heyring in combination with Wilcox;

D. Whether claims 7-9, 13, 16 and 19 would have been obvious under 35 U.S.C. §103(a) over Heyring in combination with Soo Hoo; and

E. Whether claims 11-12 would have been obvious under 35 U.S.C. §103(a) over Heyring in combination with Horan.

VII. ARGUMENT

A. <u>Legal Standards</u>

An anticipating reference, by definition, must disclose every limitation of the rejected claim in the same relationship to one another as set forth in the claim. *In re Bond*, 15 U.S.P.Q.2d (BNA) 1566, 1567 (Fed. Cir. 1990). "[I]t is incumbent upon the examiner to identify wherein each and every facet of the claimed invention is disclosed in the applied reference." *Ex parte Levy*, 17 U.S.P.Q.2d (BNA) 1461, 1462 (Pat. & Tm. Off. Bd. Pat. App. & Int. 1990).

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. M.P.E.P. § 706.02(j); *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974).

A finding of obviousness under 35 U.S.C. § 103 requires a determination of the scope and content of the prior art, the level of ordinary skill in the art, the differences between the claimed subject matter and the prior art, and whether the differences are such that the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made. *Graham v. John Deere Co.*, 148 USPQ 459 (U.S. S.Ct. 1966). To determine whether the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made, one should determine whether the prior art reference (or references when combined) teach or suggest all the claim limitations. Furthermore, it is necessary for the Examiner to identify the reason why a person of ordinary skill in the art would have combined the prior art references in the manner set forth in the claims.

B. Claims 1-4, 9-10, 14-15, and 17-18 Are Not Anticipated By Heyring

The Office rejected claims 1-4, 9-10, 14-15, and 17-18 as anticipated under 35 U.S.C. §102(e) by U.S. Letters Patent 6,010,139 ("Heyring"). An anticipating reference, by definition, must disclose every limitation of the rejected claim in the same relationship to one another as set forth in the claim. M.P.E.P. § 2131; *In re Bond*, 15 U.S.P.Q.2d (BNA) 1566, 1567 (Fed. Cir. 1990). Claim 1 recites "determining at least one dynamic property of the vehicle." Claims 2-4 and 9-10 depend from claim 1, and thus, incorporate this limitation by operation of law. 35 U.S.C. §112, ¶4. Heyring does not disclose this limitation and thus cannot anticipate these claims.

The Examiner asserts that Heyring determines speed/velocity, which is a dynamic property of the vehicle, and then manipulates the articulated suspension based on the determined speed. The Examiner contends that the Heyring specification at 2:58-3:16 supports his contention. The Examiner is mistaken in his contention. The portion of the specification relied upon by the Examiner discusses a system that does <u>not</u> sense speed/velocity for purposes of manipulating the articulated suspension. In fact, the portion of the specification cited by the Examiner indicates that the failure to sense speed/velocity produces undesirable results. In particular, this portion of Heyring describes a vehicle traversing a road surface with a plurality of parallel "speed humps." Under these road conditions, Heyring incorrectly interprets movements of the hydropneumatic system as an indication that the vehicle is experiencing high speed pitch movements. If the system described by Heyring were actually sensing the speed of the vehicle, as the Examiner contends, then it could determine that the vehicle was not experiencing movement due to <u>high-speed</u> pitch.

Nothing cited by the Examiner indicates that Heyring is sensing the speed of the vehicle for the purpose of manipulating the articulated suspension. In fact, as discussed above, the specification of Heyring cited by the Examiner indicates that Heyring is <u>not</u> sensing speed. Accordingly, Heyring, as applied by the Examiner, does not anticipate claim 1 because it does not determine at least one dynamic property of the vehicle and manipulate the articulated suspension using the determined dynamic property.

Moreover, the suspension system of Heyring may react to a change in a dynamic property but it does not determine what that dynamic property is. This is evident from the passage found at 5:17-31, which reads:

> Each pair of conduits and the front and rear wheel rams interconnected thereby constituting a respective closed circuit whereby first and second closed circuits are formed, and a pressure distribution means interposed between the first and second closed circuits and adapted to substantially achieve pressure equilibrium between said closed circuits, said pressure distribution means comprising two primary pressure chambers, each divided into two secondary pressure chambers by piston means, the piston means of said primary chambers being operatively interconnected to transfer motion therebetween, and permit controlled independent motion to vary the relative position of the piston means in said primary pressure chamber, said controlled independent movement maintaining said substantial pressure equilibrium and permitting additional controlled pitch resilience.

The suspension system of Heyring simply maintains an even balance of pressure and does not in any way care from where any imbalance might originate. In the Heyring suspension system, the actual dynamic property that is involved is immaterial.

Thus, Heyring fails to teach "determining at least one dynamic property of the vehicle". As is established above, Heyring only reacts to an adverse performance condition and takes no note of what dynamic property causes it. This is an important, real world distinction because Heyring cannot act proactively, whereas the claimed method can in some embodiments. (*see* ¶[0110[-¶[0113] of the application as published) Heyring therefore fails to anticipate any of claims 1-4 or 9-10. M.P.E.P. § 2131; *In re Bond*, 15 U.S.P.Q.2d (BNA) 1566, 1567 (Fed. Cir. 1990).

Claim 14 recites "determining a damping scenario." Claims 15 and 17-18 depend from claim 14, and thus, incorporate this limitation by operation of law. 35 U.S.C. §112, ¶4. Heyring does not disclose this limitation and thus cannot anticipate these claims.

The Examiner contends that Heyring determines a damping scenario, but his analysis of how this function is accomplished by Heyring is confusing. For example, the Examiner cites to the specification of Heyring at 7:30-36 and contends that "vehicle speed is a damping scenario." The Examiner appears confused. As should be apparent from claim 15, vehicle speed/velocity may be used in determining a damping scenario, but even if Heyring determined the speed of the vehicle, and he does not, determining vehicle speed is not the same as determining a damping scenario. The Examiner cites to the specification of Heyring at 7:30-36 for his proposition that determining vehicle speed is a damping scenario. The Examiner's position is problematic for at least two reasons. First the cited portion of Heyring does not describe determining the speed of

the vehicle. Second, the specification cited and quoted by the Examiner simply indicates that the suspension system of Heyring can produce various uncomfortable responses to poor road surfaces depending on a variety of factors. The cited portion of Heyring does not teach determining a damping scenario.

Furthermore, the Examiner relies on a misconstruction of Applicants' prior Appeal Brief. The Examiner takes a passage out of its context and then misconstrues it in a manner supporting a rejection he would like to make. More particularly, in Applicants' prior Appeal Brief, at p. 12, lines 7-16, stated:

> However, Applicants respectfully submit that sufficient disclosure has been provided that those skilled in the art will readily be able to ascertain how to "determine a damping scenario". Applicants provide a great deal of information about how the articulation of the suspension system can be dampened as a part of the articulation. (¶[0064]- ¶[0078]) Applicants also provide a great deal of information as to how the suspension may be articulated as the vehicle crosses both smooth and rough terrain. (¶[0097]- ¶[0113]) Since damping is a part of articulation and both damping and articulation have been thoroughly disclosed, those of ordinary skill in the art will certainly be able to tell what it means to "determine a damping scenario". Indeed, two specific examples are actually provided in **FIG. 11** and **FIG. 12** and are discussed in ¶[0097]- ¶[0113].

Applicants were explaining that, *in their disclosed embodiment*, damping is a part of articulation and that both are adequately disclosed. However, the Office erroneously warps this into a generalized admission that damping is inherently a part of articulation. Applicants said no such thing and such a construction is clearly erroneous when the statement is considered in its context.

Thus, Heyring fails to teach "determining a damping scenario". As is established above, Heyring only reacts to an adverse performance condition and takes no note of what dynamic property causes it and does nothing to determine a damping scenario. This is an important, real world distinction because Heyring cannot act proactively, whereas the claimed method can in some embodiments. (*see* ¶[0110[-¶[0113] of the application as published) Heyring therefore fails to anticipate any of claims 14-15 or 17-18. M.P.E.P. § 2131; *In re Bond*, 15 U.S.P.Q.2d (BNA) 1566, 1567 (Fed. Cir. 1990). Heyring therefore fails to anticipate any of claims 14-15 or 17-18.

Accordingly, for at least the reasons discussed above, Heyring does not anticipate claims 1-4, 9-10, 14-15, and 17-18.

C. Claims 5-9, 11-13, 15-16 and 19 Are Not Obvious Over the Cited Art

a. Claim 5 is not obvious over Heyring in combination Schofield

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. M.P.E.P. § 706.02(j); *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). The Examiner has rejected dependent claim 5 as being obvious over Heyring in view of various Scholfield. However, Schofield does not cure the deficiencies of Heyring discussed above in conjunction with independent claims 1 and 14. Accordingly, Applicants respectfully submit that claim 5 is not obvious over the cited combination, as neither Heyring nor Schofield disclose "determining at least one dynamic property of the vehicle." Accordingly, the art of record fails to render claim 5 obvious because it fails to teach or suggest all the limitations of the claim.

b. Claims 6 and 15 are not obvious over Heyring in combination with Wilcox

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. M.P.E.P. § 706.02(j); *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). The Examiner has rejected dependent claims 6 and 15 as being obvious over Heyring in view of Wilcox. However, Wilcox does not cure the deficiencies of Heyring discussed above in conjunction with independent claims 1 and 14. Accordingly, Applicants respectfully submit that claims 6 and 15 are not obvious over the cited

combination, as neither Heyring nor Wilcox disclose "determining at least one dynamic property of the vehicle" or "determining a damping scenario." Accordingly, the art of record fails to render dependent claims 6 and 15 obvious because it fails to teach or suggest all the limitations of the claims.

c. Claims 7-9, 13, 16 and 19 are not obvious over Heyring in combination with Soo Hoo

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. M.P.E.P. § 706.02(j); *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). The Examiner has rejected dependent claims 7-9, 13, 16 and 19 as being obvious over Heyring in view of Soo Hoo. However, Soo Hoo does not cure the deficiencies of Heyring discussed above in conjunction with independent claims 1 and 14. Accordingly, Applicants respectfully submit that dependent claims 7-9, 13, 16 and 19 are not obvious over the cited combination, as neither Heyring nor Soo Hoo discloses "determining at least one dynamic property of the vehicle" or "determining a damping scenario." Accordingly, the art of record fails to render claims 7-9, 13, 16 and 19 obvious because it fails to teach or suggest all the limitations of the claims.

d. Claims 11-12 are not obvious over Heyring in combination with Horan.

To establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. M.P.E.P. § 706.02(j); *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). The Examiner has rejected dependent claims 11-12 as being obvious over Heyring in view of Horan. However, Horan does not cure the deficiencies of Heyring discussed above in conjunction with independent claim 1. Accordingly, Applicants respectfully submit that dependent claims 11-12 are not obvious over the cited combination, as neither Heyring nor Horan discloses "determining at least one dynamic property of the vehicle." Accordingly, the art of record fails to render claims 11-12 obvious because it fails to teach or suggest all the limitations of the claims.

D. CONCLUDING REMARKS

Applicants respectfully submit that all claims are in condition for allowance.

VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal are set forth in the attached "Claims Appendix." The claims that are not subject to this appeal are also set forth for the convenience of the Board.

IX. EVIDENCE APPENDIX

There is no separate Evidence Appendix for this appeal.

X. RELATING PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

In view of the foregoing, it is respectfully submitted that the Examiner erred in not allowing claims 1-19 over the prior art of record. The undersigned may be contacted at (713) 934-4050 with respect to any questions, comments or suggestions relating to this appeal.

Respectfully submitted,

Date: June 8, 2009

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Claims Appendix

(Claims in Issue)

1. A method of controlling stability of a vehicle having an articulated suspension, comprising:

determining at least one dynamic property of the vehicle; and

manipulating the articulated suspension based on the at least one dynamic property to affect the stability of the vehicle.

2. A method, according to claim 1, wherein determining the at least one dynamic property comprises determining at least one of the inertia, velocity, acceleration, or and momentum of the vehicle.

3. A method, according to claim 1, wherein manipulating the articulated suspension comprises manipulating the articulated suspension to affect a center of gravity of the vehicle.

4. A method, according to claim 1, wherein manipulating the articulated suspension comprises manipulating the articulated suspension to affect stability limits of the vehicle.

5. A method, according to claim 1, further comprising determining an attitude or a location of the vehicle, such that manipulating the articulated suspension comprises manipulating the articulated suspension based upon the attitude or the location of the vehicle.

6. A method, according to claim 1, further comprising determining a sprung mass and an unsprung mass of the vehicle, such that manipulating the articulated suspension comprises manipulating the articulated suspension based upon the sprung and the unsprung mass.

7. A method, according to claim 1, further comprising using a predictive model to determine how the articulated suspension is to be manipulated.

8. A method, according to claim 7, wherein using the predictive model comprises using a real-time physics model of the vehicle to determine how the articulated suspension is to be manipulated.

9. A method, according to claim 1, wherein manipulating the articulated suspension comprises articulating at least one of a plurality of wheel assemblies of the articulated suspension with respect to a chassis of the vehicle.

10. A method, according to claim 1, wherein manipulating the articulated suspension comprises actively damping the articulated suspension.

11. A method, according to claim 1, further comprising articulating a turret or and a mast of the vehicle with respect to a chassis of the vehicle.

12. A method, according to claim 11, wherein articulating the turret or the mast comprises articulating the turret or the mast to substantially level loads on wheel assemblies of the articulated suspension.

13. A method, according to claim 1, wherein manipulating the articulated suspension comprises articulating at least one of a plurality of wheel assemblies with respect to a chassis of the vehicle to substantially level loads on the plurality of wheel assemblies.

14. A method of controlling stability of a vehicle having an articulated suspension, comprising:

determining a damping scenario; and

adjusting damping levels of a plurality of active dampers of the articulated suspension.

15. A method, according to claim 14, wherein determining the damping scenario comprises determining the damping scenario based upon the vehicle's mass, inertia, velocity, acceleration, attitude, position, or mission configuration.

16. A method, according to claim 14, wherein determining the damping scenario comprises determining the damping scenario based upon the terrain over which the vehicle is to travel.

17. A method, according to claim 14, further comprising sensing a dynamic response of the vehicle and analyzing the sensed dynamic response for biasing the determination of the damping scenario.

18. A method, according to claim 17, wherein sensing the dynamic response comprises sensing the vehicle's inertia, velocity, acceleration, attitude, or position.

19. A method, according to claim 17, wherein determining the damping scenario and adjusting the damping levels are carried out based upon a predictive model.

20. A method of controlling stability of a vehicle having an articulated suspension, comprising:

determining a load on each of a plurality of wheel assemblies of the articulated suspension; and

manipulating at least one component of the vehicle to affect a center of gravity of the vehicle or the vehicle's stability limits.

21. A method, according to claim 20, wherein determining the load comprises sensing a load on each suspension arm of the plurality of wheel assemblies.

22. A method, according to claim 20, wherein determining the load comprises sensing a pressure of each tire of the plurality of wheel assemblies.

23. A method, according to claim 20, wherein manipulating the at least one component comprises articulating the articulated suspension.

24. A method, according to claim 23, wherein articulating the articulated suspension comprises articulating the articulated suspension to substantially equalize the forces.

25. A method, according to claim 23, wherein articulating the articulated suspension comprises articulating at least one of the plurality of wheel assemblies with respect to a chassis of the vehicle.

26. A method, according to claim 20, wherein manipulating the component comprises articulating a turret or a mast of the vehicle with respect to a chassis of the vehicle.

27. A method, according to claim 20, wherein manipulating the component comprises manipulating the component based upon the vehicle's mass, inertia, velocity, acceleration, attitude, position, or mission configuration.

28. A method, according to claim 20, wherein manipulating the at least one component comprises manipulating the at least one component based upon the terrain over which the vehicle is to travel.

29. A method, according to claim 20, further comprising sensing a dynamic response of the vehicle and analyzing the sensed dynamic response for biasing the manipulation of the at least one component.

30. A method, according to claim 29, wherein sensing the dynamic response comprises sensing the vehicle's inertia, velocity, acceleration, attitude, or position.

31. A method, according to claim 20, further comprising:

determining a damping scenario; and

adjusting damping levels of a plurality of active dampers of the articulated suspension.

32. A method, according to claim 31, wherein determining the damping scenario comprises determining the damping scenario based upon the vehicle's mass, inertia, velocity, acceleration, attitude, position, or mission configuration.

33. A method, according to claim 31, wherein determining the damping scenario comprises determining the damping scenario based upon the terrain over which the vehicle is to travel.

34. A method, according to claim 31, further comprising sensing a dynamic response of the vehicle and analyzing the sensed dynamic response for biasing the determination of the damping scenario.

35. A method, according to claim 31, wherein sensing the dynamic response comprises sensing the vehicle's inertia, velocity, acceleration, attitude, or position.

36. A method, according to claim 31, wherein determining the damping scenario and adjusting the damping levels are carried out based upon a predictive model.

37. A method, according to claim 20, wherein determining the load and manipulating the at least one component are carried out based upon a predictive model.

38. A system for controlling stability of a vehicle having an articulated suspension, comprising:

a plurality of sensors for sensing a state of the vehicle; and

a controller coupled with the plurality of sensors and adapted to articulate at least one component of the vehicle to affect the vehicle's center of gravity or the vehicle's stability limits.

39. A system, according to claim 38, wherein the controller comprises a predictive, feed-forward controller.

40. A system, according to claim 38, wherein the articulated suspension comprises a plurality of wheel assemblies and the plurality of sensors comprises a plurality of load sensors for sensing loads on the plurality of wheel assemblies.

41. A system, according to claim 38, wherein the articulated suspension comprises a plurality of wheel assemblies each having a tire and the plurality of sensors comprises a plurality of pressure sensors for sensing pressure within the tires.

42. A system, according to claim 38, wherein the plurality of sensors comprises an inertia sensor, a velocity sensor, an acceleration sensor, an attitude sensor, a location sensor, an odometer, a global positioning unit receiver, an inertial measurement unit, or an inclinometer.

43. A system, according to claim 38, wherein the controller employs a real-time physics model for determining how to articulate the at least one component of the vehicle.

44. A system, according to claim 38, wherein the vehicle comprises a chassis and the articulated suspension comprises a plurality of wheel assemblies articulable with respect to the chassis, such that the controller is adapted to articulate the plurality of wheel assemblies to affect the center of gravity or the stability limits of the vehicle.

45. A system, according to claim 38, wherein the vehicle comprises a chassis and a turret or a mast, and the controller is adapted to articulate the turret or the mast to affect the center of gravity or the stability limits of the vehicle.

46. A vehicle, comprising:

a chassis;

at least one component articulable with respect to the chassis;

a plurality of sensors for sensing a state of the vehicle; and

a controller coupled with the plurality of sensors and adapted to articulate the at least one articulable component to affect the vehicle's center of gravity or the vehicle's stability limits.

47. A vehicle, according to claim 46, wherein the controller comprises a predictive, feed-forward controller.

48. A vehicle, according to claim 46, wherein the articulated suspension comprises a plurality of wheel assemblies and the plurality of sensors comprises a plurality of load sensors for sensing loads on the plurality of wheel assemblies.

49. A vehicle, according to claim 46, wherein the articulated suspension comprises a plurality of wheel assemblies each having a tire and the plurality of sensors comprises a plurality of pressure sensors for sensing pressure within the tires.

50. A vehicle, according to claim 46, wherein the plurality of sensors comprises an inertia sensor, a velocity sensor, an acceleration sensor, an attitude sensor, a location sensor, an odometer, a global positioning unit receiver, an inertial measurement unit, <u>or</u> ~~and~~ an inclinometer.

51. A vehicle, according to claim 46, wherein the controller employs a real-time physics model for determining how to articulate the at least one articulable component.

52. A vehicle, according to claim 46, wherein the articulated suspension comprises a plurality of wheel assemblies articulable with respect to the chassis and the controller is adapted to articulate the plurality of wheel assemblies to affect the center of gravity <u>or</u> the stability limits of the vehicle.

53. A vehicle, according to claim 46, wherein the vehicle comprises a turret or a mast and the controller is adapted to articulate the turret or the mast to affect the center of gravity or ~~and~~ the stability limits of the vehicle.